

CLAIMS:

1. An operation recognition system, comprising:

an object to be operated;

5 at least one camera configured to acquire image data of an operator, at least a predetermined number of image data being acquired in a predetermined time period;

a processor configured to perform recognition
10 processing on the acquired image data, so as to define a first virtual plane in between the object and the operator, and to determine if a predetermined part of the operator penetrates the first virtual plane; and

15 a controller configured to control the object based on the determination.

2. The system according to claim 1, wherein the processor is configured to recognize a predetermined
20 motion of the operator and the controller is operative when the processor recognizes the predetermined motion of the operator.

3. The system according to claim 1, wherein the
25 processor is configured to recognize a predetermined voice of the operator and the controller is operative when the processor recognizes the predetermined voice of the operator.

4. The system according to claim 1, wherein the processor is configured to recognize an operational authority of the operator based on the recognition
5 processing.

5. The system according to claim 1, wherein the processor is further configured to detect a part of the first virtual plane penetrated by the
10 predetermined part of the operator, and wherein the controller controls the object based on the detection.

6. The system according to claim 1, wherein, when the processor is configured to recognize an eye
15 of the operator as a view point, and to define the first virtual plane between the object and the view point.

7. The system according to claim 1, wherein, when the processor is configured to recognize a length
20 of an operator's arm, and to define the first virtual plane at a position within the recognized length from the operator.

8. The system according to claim 1, wherein the first virtual plane is defined at a variable position
25 based on the recognition.

9. The system according to claim 1, wherein the processor is configured to determine a penetration when the predetermined part of the operator penetrates the first virtual plane by more than a predetermined length.

10. The system according to claim 9, wherein the predetermined length is variable.

11. The system according to claim 1, wherein the processor is configured to determine a penetration when the predetermined part of the operator penetrates the first virtual plane for more than a predetermined period.

12. The system according to claim 11, wherein the predetermined period is variable.

13. The system according to claim 1, wherein the controller is configured to control the object based on a length by and a time period in which the predetermined part of the operator penetrates the first virtual plane.

14. The system according to claim 1, wherein the object includes a display configured to display one or more operation items, and wherein the controller is configured to control the implementation of one

of the operation items based on the recognition and the determination.

15 15. The system according to claim 14, wherein the processor is configured to recognize a predetermined motion of the operator, and the processor is configured to determine that the predetermined motion represents a click operation.

10 16. The system according to claim 14, wherein the processor is configured to recognize a predetermined motion of the operator, and the processor is configured to determine that the predetermined motion represents a double-click
15 operation.

17. The system according to claim 13, wherein the processor is configured to recognize a predetermined motion of the operator, and the
20 processor is configured to determine that the predetermined motion represents a drag operation.

18. The system according to claim 1, further comprising a second object configured to operate in
25 response to the object.

19. The system according to claim 1, wherein the processor is further configured to define a virtual

keyboard in the first virtual plane, and wherein the controller is configured to control the object in relation to a keyboard input via the virtual keyboard based on the determination.

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20. The system according to claim 19, wherein the object includes a display configured to display a keyboard image corresponding to the virtual keyboard, and wherein the keyboard image distinguishes a key
10 corresponding to the keyboard input through the virtual keyboard.

21. The system according to claim 1, wherein the processor is further configured to define a second
15 virtual plane different from the first virtual plane and a virtual keyboard in the second virtual plane and to determine if a predetermined part of the operator penetrates the second virtual plane based on the recognition, and wherein the controller is
20 configured to control the object in relation to a keyboard input via the virtual keyboard based on the determination.

22. The system according to claim 21, wherein
25 the object includes a display configured to display a keyboard image corresponding to the virtual keyboard, and wherein the keyboard image distinguishes a key corresponding to the keyboard input through the

virtual keyboard.

23. The system according to claim 1, wherein
the object includes a display configured to display
5 one or more operation items, the display including
a projector and a screen, wherein the first virtual
plane is defined in between the screen and the
operator.

10 24. The system according to claim 1, wherein
the object includes a medical apparatus.

25. The system according to claim 24, wherein
the medical apparatus comprises:

15 a display monitor configured to display one or
more operation items; and

a radiography device configured to radiograph
a specimen, wherein the controller is configured to
control the implementation of one of the operation
20 items based on the determination, and wherein the
radiography device is configured to be controlled in
response to the implementation of the said one of the
operation items.

25 26. The system according to claim 25, wherein
a position of the radiography device is configured
to be controlled when a catheter is operated by the
operator.

27. The system according to claim 1, wherein the object includes an appliance.

5 28. The system according to claim 1, further comprising a display configured to display an indicator indicating how much the predetermined part of the operator penetrates the first virtual plane.

10 29. The system according to claim 28, wherein the indicator varies in accordance with a motion of the predetermined part of the operator.

15 30. The system according to claim 1, wherein the object includes a display configured to display a virtual plane position change window and a position of the first virtual plane is changed in accordance with the determination.

20 31. An image display apparatus for displaying an image, the apparatus comprising:

 a display configured to display the image in a screen;

 a position detector configured to detect a
25 position of an operator and a position of an operator's hand;

 a virtual plane defining mechanism configured to define a virtual plane in between the screen and

the operator based on the position of the operator;
a determining mechanism configured to determine
a virtual contact between the virtual plane and the
operator's hand based on the position of the operator's
5 hand and a position of the virtual plane; and
a display control mechanism configured to
control a display of the image based on determination
by the determining element.

10 32. The apparatus according to claim 31,
further comprising a shape detector configured to
detect a shape of the operator's hand; and
a recognition mechanism configured to recognize
that the operator has an operation authority when the
15 detected shape is identical to a predetermined shape.

33. An image display apparatus for displaying
an image, comprising:

20 a display configured to display the image in a
screen;

imaging elements provided at both sides of the
screen and configured to acquire image data from
different directions;

25 a position detector configured to detect a
position of an operator relative to the screen and
a position of an operator part based on the acquired
image data;

a virtual plane defining mechanism configured

to define a virtual plane in between the screen and the operator based on the position of the operator;

a determining mechanism configured to determine a virtual contact manner between the virtual plane and the operator part based on the position of the operator part and a position of the virtual plane; and

a display control mechanism configured to determine an operation item corresponding to the contact manner based on determination by the determining mechanism and to control a display of the image according to the operation item.

34. A method of controlling an object, the method comprising steps of:

acquiring a predetermined number of image data of an operator in a predetermined time period;

performing recognition processing on the acquired image data;

defining a virtual plane in between the object and the operator;

determining if a predetermined part of the operator penetrates the virtual plane based on the recognition processing; and

controlling the object based on the determination.

35. The method according to claim 34, wherein the

acquired image data is processed to recognize an operational authority of the operator based on the recognition processing.